

PATENT COOPERATION TREATY

PCT



REC'D 14 MAR 2005

WIPO

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 904015	FOR FURTHER ACTION		See Form PCT/IPEA/416
International application No. PCT/JP2004/004571	International filing date (day/month/year) 30.03.2004	Priority date (day/month/year) 04.04.2003	
International Patent Classification (IPC) or national classification and IPC F16H61/32			
Applicant TOYOTA JIDOSHA KABUSHIKI KAISHA et al.			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of 17 sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>			
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>			
Date of submission of the demand 22.10.2004		Date of completion of this report 15.03.2005	
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016		Authorized Officer Van Prooijen, T Telephone No. +31 70 340-3180 	

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/JP2004/004571

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
 - ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
 - ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-36 as originally filed

Claims, Numbers

1-58 received on 22.10.2004 with letter of 20.10.2004

Drawings, Sheets

1/14-14/14 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
 - ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):
 4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
 - ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/JP2004/004571

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-58
	No: Claims	
Inventive step (IS)	Yes: Claims	1-58
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-58
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

Subject: Shift control system and method concerning shift control to switch between successive ranges by means of an actuator

Closest prior art: the type of shift control system and corresponding control methods are generally known, for example from US-A-2002/019287, and are also referred to as shift by wire systems.

Problem: most of these systems use some sort of encoder or potentiometer to acquire information on the actual position of the actuator (as in US-A-2002/019287). It is also known to perform calibration between the actuator and the shift means controlled by the actuator. By this calibration the relative position of the different positions corresponding to the successive ranges relative to some position (eg the neutral switch position) is established. This still requires the presence of such a switch.

Solution: by providing means that will stop the actuator in an end position (that is, a position where no adjacent range is present) and providing means that use this end position as a reference for means that establish a (count) value that is a measure for the relative rotational amount of the actuator.

Of course it is known from the prior art that actuators have end positions with no adjacent range present. It is not known from the available prior art to use this end position as a reference for a relative position establishing means for the rotating actuator. Although in other types of shift mechanisms it has been shown to use end positions as references in calibration routines, it would not seem to be obvious to use this teaching in a range shift actuator calibration device or method.

Thus claim 1, 16, 31, 31, 32, 33 and 46 and dependent claims 2 to 15, 17 to 30, 34 - 45 and 47 -58 meet the requirements of Articles 33(2) and 33(3) PCT.

**INTERNATIONAL PRELIMINARY
REPORT ON PATENTABILITY
(SEPARATE SHEET)**

International application No.

PCT/JP2004/004571

CLAIMS

1. (amended) A shift control system (10) having a plurality of successive shift ranges and switching a shift range among said plurality of successive shift ranges via an actuator (42), comprising:

shift means (100) driven by said actuator (42) for switching the shift range;
restriction means (110) for restricting, in an endmost shift range among said plurality of successive shift ranges, rotation of said actuator (42) in the direction where no adjacent shift range is present;

rotation control means (40) for rotating said actuator (42);
count means (46) for obtaining a count value according to a relative rotational amount of said actuator (42); and

position setting means (40) for setting, when said actuator (42) is rotated by said rotation control means (40) in the direction in which rotation of said actuator (42) is restricted by said restriction means (110) in said endmost shift range, a reference position of said actuator (42) corresponding to said endmost shift range based on a state of said count value obtained by said count means (46).

2. The shift control system (10) according to claim 1, wherein
said position setting means (40) includes reference position setting means for setting the reference position of said actuator (42) by detecting that said count value obtained by said count means (46) is in a state where a minimum value or a maximum value of said count value is constant for a predetermined period of time.

3. (amended) The shift control system (10) according to claim 2, wherein
said position setting means (40) includes reference position setting means for setting a reference position of said actuator (42) corresponding to another shift range different from said endmost shift range, based on a rotatable amount of said actuator

(42) between said endmost shift range and said another shift range.

4. (amended) The shift control system (10) according to claim 2, wherein
said position setting means (40) includes reference position setting means for
5 setting, when said shift means (100) switches said endmost shift range to another shift
range, a reference position of said actuator (42) corresponding to said another shift
range.

10 5. (amended) The shift control system (10) according to claim 4, wherein
said position setting means (40) includes detection means for detecting a
rotatable amount of said actuator (42) based on the reference position corresponding to
said endmost shift range and the reference position corresponding to said another shift
range.

15 6. (amended) The shift control system (10) according to claim 2, wherein
said position setting means (40) includes reference position setting means for
setting a reference position of said actuator (42) corresponding to another shift range at
a predetermined timing in order to correct a backlash due to secular change of said shift
means (100) or said restriction means (110).

20 7. (amended) The shift control system (10) according to claim 6, wherein
said position setting means (40) includes detection means for detecting a
rotatable amount of said actuator (42) based on the reference position corresponding to
said endmost shift range and the reference position corresponding to said another shift
25 range.

8. (amended) The shift control system (10) according to claim 1, wherein
said position setting means (40) includes reference position setting means for

setting a reference position of said actuator (42) corresponding to another shift range different from said endmost shift range, based on a rotatable amount of said actuator (42) between said endmost shift range and said another shift range.

5 9. (amended) The shift control system (10) according to claim 1, wherein
said position setting means (40) includes reference position setting means for
setting, when said shift means (100) switches said endmost shift range to another shift
range, a reference position of said actuator (42) corresponding to said another shift
range.

10 10. (amended) The shift control system (10) according to claim 9, wherein
said position setting means (40) includes detection means for detecting a
rotatable amount of said actuator (42) based on the reference position corresponding to
said endmost shift range and the reference position corresponding to said another shift
15 range.

 11. (amended) The shift control system (10) according to claim 1, wherein
said position setting means (40) includes reference position setting means for
setting a reference position of said actuator (42) corresponding to another shift range at
20 a predetermined timing in order to correct a backlash due to secular change of said shift
means (100) or said restriction means (110).

 12. (amended) The shift control system (10) according to claim 11, wherein
said position setting means (40) includes detection means for detecting a
25 rotatable amount of said actuator (42) based on the reference position corresponding to
said endmost shift range and the reference position corresponding to said another shift
range.

13. The shift control system (10) according to any of claims 1-12, wherein
said rotation control means (40) includes means for making smaller an output
per unit time of said actuator (42) driven for setting the reference position of said
actuator (42) than an output per unit time of said actuator (42) driven for switching the
5 shift range.

14. The shift control system (10) according to any of claims 1-12, wherein
said position setting means (40) includes setting means for setting, based on said
reference position, a target rotational position, to be attained when the shift range is
10 switched, of said actuator (42) in the shift range with said reference position being set.

15. The shift control system (10) according to claim 14, wherein
said rotation control means (40) includes adjustment means for adjusting, when
the shift range is switched, the rotational amount of said actuator (42) to allow said
15 actuator (42) to attain said target rotational position by rotating said actuator (42) to
drive said shift means (100).

16. (amended) A shift control system (10) having a plurality of successive shift
ranges and switching a shift range among said plurality of successive shift ranges via an
20 actuator (42), comprising:

a shift component (100) driven by said actuator (42) for switching the shift
range;

a restriction component (110) for restricting, in an endmost shift range among
said plurality of successive shift ranges, rotation of said actuator (42) in the direction
25 where no adjacent shift range is present;

a rotation control unit (40) for rotating said actuator (42);

a count unit (46) for obtaining a count value according to a relative rotational
amount of said actuator (42); and

5 a position setting unit (40) for setting, when said actuator (42) is rotated by said rotation control unit (40) in the direction in which rotation of said actuator (42) is restricted by said restriction unit (110) in said endmost shift range, a reference position of said actuator (42) corresponding to said endmost shift range based on a state of said count value obtained by said count unit (46).

10 17. The shift control system (10) according to claim 16, wherein said position setting unit (40) sets the reference position of said actuator (42) by detecting that said count value obtained by said count unit (46) is in a state where a minimum value or a maximum value of said count value is constant for a predetermined period of time.

15 18. (amended) The shift control system (10) according to claim 17, wherein said position setting unit (40) sets a reference position of said actuator (42) corresponding to another shift range different from said endmost shift range, based on a rotatable amount of said actuator (42) between said endmost shift range and said another shift range.

20 19. (amended) The shift control system (10) according to claim 17, wherein said position setting unit (40) sets, when said shift component (100) switches said endmost shift range to another shift range, a reference position of said actuator (42) corresponding to said another shift range.

25 20. (amended) The shift control system (10) according to claim 19, wherein said position setting unit (40) detects a rotatable amount of said actuator (42) based on the reference position corresponding to said endmost shift range and the reference position corresponding to said another shift range.

21. (amended) The shift control system (10) according to claim 17, wherein
said position setting unit (40) sets a reference position of said actuator (42)
corresponding to another shift range at a predetermined timing in order to correct a
backlash due to secular change of said shift component (100) or said restriction
component (110).

22. (amended) The shift control system (10) according to claim 21, wherein
said position setting unit (40) detects a rotatable amount of said actuator (42)
based on the reference position corresponding to said endmost shift range and the
reference position corresponding to said another shift range.

23. (amended) The shift control system (10) according to claim 16, wherein
said position setting unit (40) sets a reference position of said actuator (42)
corresponding to another shift range different from said endmost shift range, based on a
rotatable amount of said actuator (42) between said endmost shift range and said
another shift range.

24. (amended) The shift control system (10) according to claim 16, wherein
said position setting unit (40) sets, when said shift component (100) switches
said endmost shift range to another shift range, a reference position of said actuator (42)
corresponding to said another shift range.

25. (amended) The shift control system (10) according to claim 24, wherein
said position setting unit (40) detects a rotatable amount of said actuator (42)
based on the reference position corresponding to said endmost shift range and the
reference position corresponding to said another shift range.

26. (amended) The shift control system (10) according to claim 16, wherein

said position setting unit (40) sets a reference position of said actuator (42) corresponding to another shift range at a predetermined timing in order to correct a backlash due to secular change of said shift component (100) or said restriction component (110).

5

27. (amended) The shift control system (10) according to claim 26, wherein said position setting unit (40) detects a rotatable amount of said actuator (42) based on the reference position corresponding to said endmost shift range and the reference position corresponding to said another shift range.

10

28. The shift control system (10) according to any of claims 16-27, wherein said rotation control unit (40) makes smaller an output per unit time of said actuator (42) driven for setting the reference position of said actuator (42) than an output per unit time of said actuator (42) driven for switching the shift range.

15

29. The shift control system (10) according to any of claims 16-27, wherein said position setting unit (40) sets, based on said reference position, a target rotational position, to be attained when the shift range is switched, of said actuator (42) in the shift range with said reference position being set.

20

30. The shift control system (10) according to claim 29, wherein said rotation control unit (40) adjusts, when the shift range is switched, the rotational amount of said actuator (42) to allow said actuator (42) to attain said target rotational position by rotating said actuator (42) to drive said shift component (100).

25

31. (amended) A shift control method for switching a shift range among a plurality of successive shift ranges via an actuator (42), comprising the steps of:
rotating by said actuator (42) shift means (100) for switching the shift range;

stopping rotation of said actuator (42) by restriction means (110) for restricting, in an endmost shift range among said plurality of successive shift ranges, rotation of said actuator (42) in the direction where no adjacent shift range is present;

5 detecting a reference position corresponding to said endmost shift range based on a position where said stopping is effected; and

determining, based on said reference position, a target rotational position when the shift range is switched by said actuator (42).

10 32. (amended) A shift control method for switching a shift range among a plurality of successive shift ranges via an actuator (42), comprising the steps of:
rotating by said actuator (42) a shift component (100) for switching the shift range;

15 stopping rotation of said actuator (42) by a restriction component (110) for restricting, in an endmost shift range among said plurality of successive shift ranges, rotation of said actuator (42) in the direction where no adjacent shift range is present;

detecting a reference position corresponding to said endmost shift range based on a position where said stopping is effected; and

determining, based on said reference position, a target rotational position when the shift range is switched by said actuator (42).

20

33. (amended) A shift range switching device of an automatic transmission mounted on a vehicle, comprising:

shift means (100) for switching a shift position to one of a plurality of successive shift positions by rotating an actuator (42);

25 storage means for storing said one of shift positions resulting from switching by said shift means (100);

first restriction means for restricting, in a first shift position corresponding to one end position among said plurality of successive shift positions, rotation of said actuator

(42) in a direction where no adjacent shift position is present; and
control means (40) for controlling rotation of said actuator (42),
said control means (40) including

5 first position setting means for setting, as a first reference position in said first
shift position, a position where the rotation of said actuator (42) is stopped by said first
restriction means,

electric power supply control means for permitting shut-off of electric power
supply to said shift range switching device for said first shift position, and

10 reference position re-setting means for setting again said first reference position
by said first position setting means, when electric power supply is resumed after said
shut-off of electric power supply, on the condition that said shift position stored in said
storage means is unknown.

15 34. (amended) The shift range switching device of an automatic transmission
according to claim 33, further comprising second restriction means for restricting, in a
second shift position corresponding to the other end position among said plurality of
successive shift positions, rotation of said actuator (42) in a direction where no adjacent
shift position is present, wherein

20 said control means (40) further includes
second position setting means for setting, as a second reference position in said
second shift position, a position where the rotation of said actuator (42) is stopped by
said second restriction means, according to re-setting of said first reference position by
said reference position re-setting means, and

25 movable range calculation means for calculating a movable range of said
actuator (42) based on said first reference position re-set by said reference position re-
setting means and said second reference position set by said second position setting
means.

35. The shift range switching device of an automatic transmission according to claim 34, further comprising count means (46) for obtaining a count value according to a rotational amount of said actuator (42), wherein

5 said position setting means includes reference position setting means for setting said reference position of said actuator (42) by detecting that said count value obtained by said count means (46) is in a state where a minimum value or a maximum value of said count value is constant for a predetermined period of time.

10 36. (amended) The shift range switching device of an automatic transmission according to claim 34, wherein

 said first restriction means includes means for restricting the rotation of said actuator (42) in said direction where no adjacent shift position is present, in a manner that the rotation of said actuator (42) is restricted in a direction of contracting a detent spring (110), and

15 said second restriction means includes means for restricting the rotation of said actuator (42) in said direction where no adjacent shift position is present, in a manner that the rotation of said actuator (42) is restricted in a direction of pulling said detent spring (110).

20 37. The shift range switching device of an automatic transmission according to claim 33, wherein

 said control means (40) further includes determination means for determining a first target rotational position to be attained when the shift position is switched by said actuator (42) to said first shift position, based on said first reference position re-set by
25 said reference position re-setting means.

38. (amended) The shift range switching device of an automatic transmission according to claim 37, further comprising second restriction means for restricting, in a

second shift position corresponding to the other end position among said plurality of successive shift positions, rotation of said actuator (42) in a direction where no adjacent shift position is present, wherein

said control means (40) further includes

5

second position setting means for setting, as a second reference position in said second shift position, a position where the rotation of said actuator (42) is stopped by said second restriction means, according to re-setting of said first reference position by said reference position re-setting means, and

10

determination means for determining a second target rotational position to be attained when the shift position is switched by said actuator (42) to said second shift position, based on said second reference position.

15

39. The shift range switching device of an automatic transmission according to claim 38, further comprising count means (46) for obtaining a count value according to a rotational amount of said actuator (42), wherein

said position setting means includes reference position setting means for setting said reference position of said actuator (42) by detecting that said count value obtained by said count means (46) is in a state where a minimum value or a maximum value of said count value is constant for a predetermined period of time.

20

40. (amended) The shift range switching device of an automatic transmission according to claim 38, wherein

25

said first restriction means includes means for restricting the rotation of said actuator (42) in said direction where no adjacent shift position is present, in a manner that the rotation of said actuator (42) is restricted in a direction of contracting a detent spring (110), and

said second restriction means includes means for restricting the rotation of said actuator (42) in said direction where no adjacent shift position is present, in a manner

that the rotation of said actuator (42) is restricted in a direction of pulling said detent spring (110).

5 41. The shift range switching device of an automatic transmission according to claim 37, further comprising count means (46) for obtaining a count value according to a rotational amount of said actuator (42), wherein

 said position setting means includes reference position setting means for setting said reference position of said actuator (42) by detecting that said count value obtained by said count means (46) is in a state where a minimum value or a maximum value of
10 said count value is constant for a predetermined period of time.

 42. (amended) The shift range switching device of an automatic transmission according to claim 37, wherein

 said first restriction means includes restriction means for restricting the rotation
15 of said actuator (42) in said direction where no adjacent shift position is present, in a manner that the rotation of said actuator (42) is restricted in a direction of contracting a detent spring (110).

20 43. The shift range switching device of an automatic transmission according to claim 33, further comprising count means (46) for obtaining a count value according to a rotational amount of said actuator (42), wherein

 said position setting means includes reference position setting means for setting said reference position of said actuator (42) by detecting that said count value obtained by said count means (46) is in a state where a minimum value or a maximum value of
25 said count value is constant for a predetermined period of time.

 44. (amended) The shift range switching device of an automatic transmission according to claim 33, wherein

said first restriction means includes restriction means for restricting the rotation of said actuator (42) in said direction where no adjacent shift position is present, in a manner that the rotation of said actuator (42) is restricted in a direction of contracting a detent spring (110).

5

45. The shift range switching device of an automatic transmission according to any of claims 33-44, wherein

said first shift position is a P position allowing a parking mechanism to operate by driving said actuator (42), and

10

said second shift position is a non-P position inhibiting said parking mechanism from operating.

46. (amended) A shift range switching device of an automatic transmission mounted on a vehicle, comprising:

15

a shift component (100) for switching a shift position to one of a plurality of successive shift positions by rotating an actuator (42);

a storage unit for storing said one of shift positions resulting from switching by said shift component (100);

20

a first restriction component for restricting, in a first shift position corresponding to one end position among said plurality of successive shift positions, rotation of said actuator (42) in a direction where no adjacent shift position is present; and

a control unit (40) for controlling rotation of said actuator (42),

said control unit (40) including

25

a first position setting unit for setting, as a first reference position of said first shift position, a position where the rotation of said actuator (42) is stopped by said first restriction component,

an electric power supply control unit for permitting shut-off of electric power supply to said shift range switching device for said first shift position, and

a reference position re-setting unit for setting again said first reference position by said first position setting unit, when electric power supply is resumed after said shut-off of electric power supply, on the condition that said shift position stored in said storage unit is unknown.

5

47. (amended) The shift range switching device of an automatic transmission according to claim 46, further comprising a second restriction component for restricting, in a second position corresponding to the other end position among said plurality of successive shift positions, rotation of said actuator (42) in a direction where no adjacent shift position is present, wherein

10

said control unit (40) further includes

a second position setting unit for setting, as a second reference position of said second shift position, a position where the rotation of said actuator (42) is stopped by said second restriction component, according to re-setting of said first reference position by said reference position re-setting unit, and

15

a movable range calculation unit for calculating a movable range of said actuator (42) based on said first reference position re-set by said reference position re-setting unit and said second reference position set by said second position setting unit.

20

48. The shift range switching device of an automatic transmission according to claim 47, further comprising a count unit (46) for obtaining a count value according to a rotational amount of said actuator (42), wherein

said position setting unit sets said reference position of said actuator (42) by detecting that said count value obtained by said count unit (46) is in a state where a minimum value or a maximum value of said count value is constant for a predetermined period of time.

25

49. (amended) The shift range switching device of an automatic transmission

according to claim 47; wherein

said first restriction component restricts the rotation of said actuator (42) in said direction where no adjacent shift position is present, in a manner that the rotation of said actuator (42) is restricted in a direction of contracting a detent spring (110), and

5 said second restriction component restricts the rotation of said actuator (42) in said direction where no adjacent shift position is present, in a manner that the rotation of said actuator (42) is restricted in a direction of pulling said detent spring (110).

10 50. The shift range switching device of an automatic transmission according to claim 46, wherein

said control unit (40) further includes a setting unit for determining a first target rotational position to be attained when the shift position is switched by said actuator (42) to said first shift position, based on said first reference position re-set by said reference position re-setting unit.

15

20 51. (amended) The shift range switching device of an automatic transmission according to claim 50, further comprising a second restriction component for restricting, in a second shift position corresponding to the other end position among said plurality of successive shift positions, rotation of said actuator (42) in a direction where no adjacent shift position is present, wherein

said control unit (40) further includes

25 a second position setting unit for setting, as a second reference position of said second shift position, a position where the rotation of said actuator (42) is stopped by said second restriction component, according to re-setting of said first reference position by said reference position re-setting unit, and

a setting unit for determining a second target rotational position to be attained when the shift position is switched by said actuator (42) to said second shift position, based on said second reference position.

52. The shift range switching device of an automatic transmission according to claim 51, further comprising a count unit (46) for obtaining a count value according to a rotational amount of said actuator (42), wherein

5 said position setting unit sets said reference position of said actuator (42) by detecting that said count value obtained by said count unit (46) is in a state where a minimum value or a maximum value of said count value is constant for a predetermined period of time.

10 53. (amended) The shift range switching device of an automatic transmission according to claim 51, wherein

 said first restriction component restricts the rotation of said actuator (42) in said direction where no adjacent shift position is present, in a manner that the rotation of said actuator (42) is restricted in a direction of contracting a detent spring (110), and

15 said second restriction component restricts the rotation of said actuator (42) in said direction where no adjacent shift position is present, in a manner that the rotation of said actuator (42) is restricted in a direction of pulling said detent spring (110).

20 54. The shift range switching device of an automatic transmission according to claim 50, further comprising a count unit (46) for obtaining a count value according to a rotational amount of said actuator (42), wherein

 said position setting unit sets said reference position of said actuator (42) by detecting that said count value obtained by said count unit (46) is in a state where a minimum value or a maximum value of said count value is constant for a predetermined
25 period of time.

55. (amended) The shift range switching device of an automatic transmission according to claim 50, wherein

said first restriction component restricts the rotation of said actuator (42) in said direction where no adjacent shift position is present, in a manner that the rotation of said actuator (42) is restricted in a direction of contracting a detent spring (110).

5 56. The shift range switching device of an automatic transmission according to claim 46, further comprising a count unit (46) for obtaining a count value according to a rotational amount of said actuator (42), wherein

10 said position setting unit sets said reference position of said actuator (42) by detecting that said count value obtained by said count unit (46) is in a state where a minimum value or a maximum value of said count value is constant for a predetermined period of time.

15 57. (amended) The shift range switching device of an automatic transmission according to claim 46, wherein

15 said first restriction component restricts the rotation of said actuator (42) in said direction where no adjacent shift position is present, in a manner that the rotation of said actuator (42) is restricted in a direction of contracting a detent spring (110).

20 58. The shift range switching device of an automatic transmission according to any of claims 46-57, wherein

 said first shift position is a P position allowing a parking mechanism to operate by driving said actuator (42), and

 said second shift position is a non-P position inhibiting said parking mechanism from operating.